WHAT IS CLAIMED IS:

1. A separator for a fuel cell that is capable of closely contacting either an anode or a cathode of an MEA (membrane electrode assembly) of a fuel cell and interposing a fluid diffusion layer, the separator having a flow field channel for allowing a fluid to flow between the separator and the fluid diffusion layer, characterized in that:

the separator comprises a lamellar structure graphite foil; and

a hydrophobic layer is formed by impregnation on an interior side of the flow field channel.

2. The separator for a fuel cell as claimed in claim 1, wherein the lamellar structure graphite foil comprises a stainless steel layer therewithin.

3. The separator for a fuel cell as claimed in claim 2, wherein the stainless steel layer is exteriorly exposed, interposing the hydrophobic layer.

4. The separator for a fuel cell as claimed in claim 1, wherein the graphite foil is substantially free from thermosetting or thermoplastic resin.

5. The separator for a fuel cell as claimed in claim 1, wherein a bulk density of the graphite foil lies in the range of $1.5 g/cm^3$ to $2.0 g/cm^3$.

6. The separator for a fuel cell as claimed in one of claims 1-5,

wherein thickness of the graphite foil lies in the range of 0.5mm to 3mm.

7. The separator for a fuel cell as claimed in one of claims 1-5, wherein thickness of the hydrophobic layer lies in the range of 30μm to 100μm.

8. The separator for a fuel cell as claimed in one of claims 1-5, wherein:

at least one manifold is formed in the separator; and

a sealing member is unified to the separator along each circumference of the at least one manifold and an area for contacting the fluid diffusion layer.

9. The separator for a fuel cell as claimed in claim 8, wherein the sealing member encloses, respectively along a closed curve, each of the at least one manifold and the area for contacting the fluid diffusion layer.

10. A method for manufacturing a fuel cell having a separator for a fuel cell that is capable of closely contacting either an anode or a cathode of an MEA (membrane electrode assembly) of a fuel cell and interposing a fluid diffusion layer, the separator having a flow field channel for allowing a fluid to flow between the separator and the fluid diffusion layer, the method comprising:

preparing a graphite foil of a predetermined size;

forming a mask pattern on the graphite foil corresponding to the flow field channel;

forming the flow field channel on the graphite foil by etching the graphite foil formed with the mask pattern thereon;

forming a hydrophobic layer on an interior side of the flow field channel by impregnation; and

removing the mask pattern from the graphite foil.

11. The method for manufacturing a fuel cell as claimed in claim 10, wherein the forming of a mask pattern on the graphite foil comprises:

coating the graphite foil with a dry film resist;

exposing the coated graphite foil; and

developing the dry film resist on the graphite foil by moving a spray nozzle of a spray-type developing apparatus thereover.

12. The method for manufacturing a fuel cell as claimed in claim 10, wherein the forming of a mask pattern on the graphite foil comprises attaching a mask on the graphite foil, the mask being provided with a pattern corresponding to the flow field channel and being made of rubber or stainless steel.

13. The method for manufacturing a fuel cell as claimed in claim 10,

wherein the forming of the flow field channel on the graphite foil comprises at least one of sandblasting and ultrasonic etching.

14. The method for manufacturing a fuel cell as claimed in one of claims 10-13, wherein the forming a hydrophobic layer on the interior side of the flow field channel by impregnation comprises:

forming a hydrophobic layer on the graphite foil attached with the mask pattern and formed with the flow field channel; and

drying the graphite foil formed with the hydrophobic layer, in a temperature range of 50°C-90°C.

15. The method for manufacturing a fuel cell as claimed in claim 14, wherein, in the forming of a hydrophobic layer on the graphite foil, a hydrophobic solution is spray coated on a surface of the graphite foil, or the graphite foil is dipped in the hydrophobic solution.

16. The method for manufacturing a fuel cell as claimed in claim 10, wherein:

the flow field channel is formed on each of front and rear sides of the separator;

the mask pattern comprises a front mask pattern and a rear mask pattern;

at least one pair of aligning holes are formed at each of the front and

rear mask patterns;

at least one aligning hole is formed through the graphite foil corresponding to the aligning holes of the mask patterns; and

the aligning holes of the mask patterns and the aligning holes of the graphite foil are aligned by using at least one pair of aligning bars corresponding thereto.

17. The method for manufacturing a fuel cell as claimed in claim 16, wherein the at least one pair of aligning holes and the at least one pair of aligning bars respectively comprise a plurality of pairs thereof, corresponding to different sizes.

18. A fuel cell stack comprising at least one unit cell, wherein the at least one unit cell comprises:

an MEA (membrane electrode assembly) comprising a polymer electrolyte membrane, and an anode and a cathode formed on both sides thereof;

a pair of fluid diffusion layers contiguously disposed to the anode and the cathode at both sides of the MEA; and

a pair of separators for closely contacting the pair of fluid diffusion layers, forming flow field channels on sides thereof facing the fluid diffusion layers so as to form a reaction region, and forming manifold regions peripheral to the reaction region,

wherein at least one of the pair of separators comprises a lamellar structure graphite foil, and

a hydrophobic layer is formed by impregnation on an interior side of the flow field channels of the at least one of the pair of separators.

19. The fuel cell stack as claimed in claim 18, wherein the lamellar structure graphite foil comprises a stainless steel layer therewithin.

20. The fuel cell stack as claimed in claim 19, wherein the stainless steel layer is exteriorly exposed, interposing the hydrophobic layer.

21. The fuel cell stack as claimed in claim 18, wherein the graphite foil is substantially free from thermosetting or thermoplastic resin.

22. The fuel cell stack as claimed in claim 18, wherein a bulk density of the graphite foil lies in the range of 1.5g/cm^3 to 2.0g/cm^3.

23. The fuel cell stack as claimed in one of claims 18-22, wherein thickness of the graphite foil lies in the range of 0.5mm to 3mm.

24. The fuel cell stack as claimed in one of claims 18-22, wherein thickness of the hydrophobic layer lies in the range of 30μm to 100μm.

25. The fuel cell stack as claimed in one of claims 18-22, wherein a sealing member is unified to the separator along each circumference of the manifold and the reaction region.